



## **D2.1: ECOSYSTEM DEFINITION AND REQUIREMENTS**

### **ANNEX 4: TECHNICAL GLOSSARY AND REFERENCES**

This annex provides definitions for the key technical terms used in the D2.1 deliverable.

## D2.1: Ecosystem definition and requirements

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<p><b>Abstract</b></p>	<p>The COP-PILOT platform is an open collaborative system for managing services across IoT, edge and core computing environments. COP-PILOT is built to enable secure and intelligent operations that connect diverse sectors.</p> <p>This document brings together an ecosystem of technical blueprints and services models across 5 main domains to support the development of these infrastructures. With a focus on seamless cross domain integration, it lays the foundation for private edge deployments and digital ecosystems across Europe.</p> <p>This deliverable sets the direction for building a platform that drives smarter, more secure, and collaborative digital transformations across multiple industries.</p>
<p><b>Keywords</b></p>	<p>IoT Interoperability. Edge Computing. 5G Connectivity, System Intelligence, Automation, Private Edge Systems, Large Scale. Mining, Ports and Logistics, Energy, Agriculture, Viticulture,</p>

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SEN	Sensitive, limited under the conditions of the Grant Agreement	
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\* R: Document, report (excluding the periodic and final reports)

DEM: Demonstrator, pilot, prototype, plan designs

DEC: Websites, patents filing, press & media actions, videos, etc.

DATA: Data sets, microdata, etc.

DMP: Data management plan

ETHICS: Deliverables related to ethics issues.

SECURITY: Deliverables related to security issues

OTHER: Software, technical diagram, algorithms, models, etc.

## COP-PILOT GLOSSARY

### TECHNICAL GLOSSARY

Table 4.1: Technical terms & definitions.

Term	Definitions	Reference
<b>5G Core (5GC)</b>	The central network component of 5G, based on a Service-Based Architecture (SBA). It separates control and user planes and supports key features like network slicing, QoS differentiation, and edge computing integration	[1]
<b>5G RedCap</b>	5G Reduced Capability. A low-cost version of 5G with lower bandwidth and more energy efficient.	[2]
<b>Analytical Hierarchy Process (AHP)</b>	A structured decision-making technique used to prioritize and select alternatives based on multiple criteria. It involves decomposing a complex problem into a hierarchy of objectives, criteria, and alternatives, then using pairwise comparisons to assign weights to each element. The process leverages mathematical consistency checks to ensure logical coherence in judgments. AHP synthesizes results to derive priority scores, aiding in objective, data-driven decision-making for scenarios like resource allocation, risk assessment, or strategic planning.	[3]
<b>Application Programming Interface(s) (APIs)</b>	A set of rules or protocols that enables software applications to communicate with each other to exchange data, features and functionality	[4]
<b>Application-Embedded Networking</b>	A networking approach in which security and connectivity are built directly into applications (via SDKs or APIs), eliminating reliance on traditional VPNs or perimeter-based security, enabled by the NetFoundry/OpenZiti foundation of the SIF.	[5]
<b>Service Artifact Repository</b>	A centralized system (e.g., Nexus, Artifactory, Harbor) for storing and managing software build outputs (artifacts, container images) used in CI/CD pipelines.	[6]
<b>Behind-The-Meter (BTM) Loads</b>	BTM Loads are energy consumption and generation activities that occur on the customer's side of the utility meter, making them invisible to the utility in real time.	[7]
<b>Biogas Plant</b>	A biogas plant is a facility that converts organic waste into renewable energy and fertilizer through anaerobic digestion (See also reference in Cluster 3E)	[8]
<b>Business domain</b>	A business domain is a coherent area of expertise, capability, or operations within an organisation, representing a natural sphere of business concerns, rules, processes, information,	[9]

	<p>and value-creation. It groups together related business functions, stakeholders, entities, and responsibilities under a shared theme or area of activity (for example Finance, Supply Chain, Customer Management). The domain defines the relevant business logic, vocabulary (terms), performance metrics, constraints, and governance for that area. Importantly, a business domain provides logical boundaries for organising, modelling, designing and governing systems, regardless of organisational or technical structure.</p>	
<b>Business Model Canvas</b>	<p>The Business Model Canvas is a strategic management template used to visualize, design, and describe the key components of a business model. It provides a structured framework to outline how an organization creates, delivers, and captures value. It fosters alignment, innovation, and clarity by presenting a holistic view of a business in a single, concise visual format.</p>	<a href="#">[10]</a>
<b>Business Portal</b>	<p>A web-based front-end that serves as a unified entry point for users to access business services, dashboards, and role-specific workflows.</p>	<a href="#">[11]</a>
<b>Cascade stop</b>	<p>A line event in which the blockage of a downstream machine causes upstream machines to become blocked and/or downstream machines to become starved, propagating downtime. The analysis of “blocked/starved” conditions and buffer sizing are used to mitigate it and improve the Availability component of OEE.</p>	<a href="#">[12]</a>
<b>Charging Session</b>	<p>The period during which a single EVSE provides energy to an EV, typically starting when the EV plugs in and/or user authentication succeeds, and ending when the plug is removed or the session is stopped remotely.</p>	<a href="#">[13]</a>
<b>Charging Station Management System (CSMS)</b>	<p>The central system that manages a network of charging stations (EVSEs), providing monitoring, control, user management, authorization, and billing functionalities.</p>	<a href="#">[14]</a>
<b>CI/CD Pipeline</b>	<p>A series of automated steps (build, test, deploy) executed in sequence to move code from development to production.</p>	<a href="#">[15]</a>
<b>CI/CD Tools</b>	<p>Software platforms that implement CI/CD automation (build, test, deploy). Common examples: Jenkins, Tekton, Spinnaker, Jenkins X (CDF projects); Argo CD (GitOps CD for Kubernetes); GitHub Actions (CI/CD in-repo).</p>	<a href="#">[16]</a>
<b>Cluster</b>	<p>Clusters are groups of firms, related economic actors, and institutions located near each other and with sufficient scale to develop specialised expertise, services, resources, suppliers and skills</p>	<a href="#">[17]</a>

<b>Cluster domain</b>	A cluster domain is a thematic area of specialization within a broader innovation ecosystem (i.e., the cluster itself) that groups together related activities and stakeholders around a common technological, industrial, or application focus.	<a href="#">[18]</a>
<b>Containerization</b>	The practice of packaging applications and their dependencies into lightweight, portable containers (e.g., Docker), ensuring consistency across environments.	<a href="#">[19]</a>
<b>Continuous Delivery (CD)</b>	Practice of always keeping software in a deployable state through automated build, test, and release processes, so it can be released on demand.	<a href="#">[20]</a>
<b>Continuous Deployment</b>	An extension of Continuous Delivery where every validated change is automatically deployed into production without manual approval.	<a href="#">[21]</a>
<b>Continuous Integration (CI)</b>	A development practice where code changes are automatically built, tested, and merged frequently into a shared repository to detect integration issues early.	<a href="#">[22]</a>
<b>Control Plane</b>	The part of the network that determines data access and whether a participant can legitimately send and receive data to parts of the system.	<a href="#">[23]</a>
<b>CO-Pilot</b>	Collaborative Open Platform - PILOT	<a href="#">[24]</a>
<b>Data Broker</b>	A standards compliant tool used for holding the communicable state of the system as a digital twin. A mechanism used to ensure loose coupling between data layers and required for data exchange	<a href="#">[25]</a>
<b>Data Connector</b>	An interoperability layer designed to transform low level IoT protocols into a standards compliant format for use in a digital twin.	<a href="#">[26]</a>
<b>Data Federation</b>	A mechanism of seamless communication between data brokers allowing for operators to achieve a holistic view of data across multiple domains simultaneously.	<a href="#">[27]</a>
<b>Data Plane</b>	The part of the network architecture responsible for moving data around the system	<a href="#">[28]</a>
<b>DER (Distributed Energy Resources)</b>	DERs are small-scale energy resources—such as generation, storage, and flexible loads—located close to the point of electricity use, and typically connected to distribution networks	<a href="#">[29]</a>
<b>Digital Inclusion</b>	An equitable, meaningful, and safe access to use, lead, and design of digital technologies, services, and associated opportunities for everyone, everywhere (i.e. the ability to access, utilise, and leverage ubiquitous information and communication technologies).	<a href="#">[30]</a>
<b>DIRP</b>	Digital IoT Recycling Platform	<a href="#">[31]</a>

<b>Distribution Management System (DMS)</b>	A DMS is an integrated software platform that enables electric utilities to monitor, control, and optimize the operation of their power distribution networks in real time.	<a href="#">[32]</a>
<b>DLT</b>	Distributed ledger technology, Hyperledger Fabric for supply chain transparency, transaction logging, authenticity and immutability.	<a href="#">[33]</a>
<b>Domain Orchestrator</b>	A Domain Orchestrator manages resources and services within a specific technological domain. Each domain (e.g., RAN, Transport, Core, Edge/Cloud, IT) may have its own orchestrator responsible for lifecycle management, optimization, and exposure of capabilities.	<a href="#">[34]</a>
<b>Edge computing</b>	Edge computing is a computing paradigm that processes data at or near the source of data generation, rather than relying solely on centralized cloud servers. (See also additional reference in Cluster 3A below)	<a href="#">[35]</a>
<b>Electric Vehicle (EV)</b>	Any vehicle propelled by an electric motor drawing current from a rechargeable energy storage system such as batteries, fuel cells, etc., which is manufactured primarily for use on public streets, roads, or highways.	<a href="#">[36]</a>
<b>Electric Vehicle Supply Equipment (EVSE)</b>	All the equipment used to supply electric energy to an electric vehicle, excluding the vehicle, such as the connection to the AC/DC supply network, protection devices (fuses, breakers, RCDs), control, communication, and safety interfaces, power conversion equipment	<a href="#">[37]</a>
<b>Environmental Sustainability</b>	The property of being environmentally sustainable; the degree to which a process or enterprise is able to be maintained or continued while avoiding the long-term depletion of natural resources	<a href="#">[38]</a>
<b>ETSI</b>	The European Telecommunications Standards Institute (ETSI) is an independent, not-for-profit, standardization organization operating in the field of information and communications.	<a href="#">[39]</a>
<b>ETSI CIM</b>	ETSI Context Information Management	<a href="#">[40]</a>
<b>ETSI SDG OSL</b>	The ETSI Software Development Group for OpenSlice (SDG OSL) is developing an open-source Operations Support System (OSS) with the aim to deliver Network-as-a-Service (NaaS) following specifications from major SDOs including ETSI, TM Forum and GSMA	<a href="#">[41]</a>
<b>ETSI SDG TFS</b>	The ETSI Software Development Group TeraFlowSDN (SDG TFS) is developing an open-source cloud native SDN controller enabling smart connectivity services for future networks beyond 5G.	<a href="#">[42]</a>

<b>FIWARE Context Broker</b>	The FIWARE Context Broker is a software component that manages and shares real-time context information (about entities, their attributes, and relationships) using the NGSI API, enabling systems, sensors, and applications to exchange and subscribe to updates in a standardized way.	<a href="#">[43]</a>
<b>GDPR</b>	<p>The EU general data protection regulation (GDPR) is the strongest privacy and security law in the world.</p> <p>This regulation updated and modernised the principles of the 1995 data protection directive. It was adopted in 2016 and entered into application on 25 May 2018.</p> <p>The GDPR defines:</p> <ul style="list-style-type: none"> <li>individuals' fundamental rights in the digital age</li> <li>the obligations of those processing data</li> <li>methods for ensuring compliance</li> <li>sanctions for those in breach of the rules</li> </ul>	<a href="#">[44]</a>
<b>GNSS</b>	Global Navigation Satellite System	<a href="#">[45]</a>
<b>Infrastructure as Code (IaC)</b>	Managing and provisioning infrastructure through code (e.g., Terraform, Ansible, Helm) instead of manual processes, enabling repeatability and scalability.	<a href="#">[46]</a>
<b>Internet Domain</b>	<p>An internet domain is an administrative structure for organizing, delivering and accessing services on the internet.</p> <p>The terms "domain" and "domain name" are often used interchangeably (in context of the internet) because the domain structure is associated with how domains are named. Internet domains are set up in accordance with the Domain Name Service (DNS), an application layer protocol and service used on networks to translate host names to their associated IP addresses.</p>	<a href="#">[47]</a>
<b>Integration Testing</b>	A testing practice focused on validating that different components or systems interact correctly.	<a href="#">[48]</a>
<b>IoT</b>	A network of physical devices, vehicles, appliances and other physical objects that are embedded with sensors, software, and network connectivity, allowing them to collect and share data. (See also additional reference in Cluster 3A)	<a href="#">[49]</a>
<b>IoT Agent</b>	<p>An IoT Agent is a software component that acts as a translator between an IoT device and a platform that manages the data (the central data platform - "Context Broker"). This component allows to simplify the management and integration of devices.</p> <p>It collects data from devices using heterogeneous protocols and translates them into the standard platform language: NGSI entities (allowing also to send commands to devices). It also works in reverse, translating commands from the platform into a format the device can execute.</p>	<a href="#">[50]</a>

<b>IoT device</b>	Any object connected to the internet that can collect, send, or receive data.	<a href="#">[51]</a>
<b>IoT platform</b>	Software that connects and manages IoT devices, collects their data, and makes it usable for applications. It helps developers and companies build solutions by handling communication, storage, and analysis of data from connected devices.	<a href="#">[52]</a>
<b>JIT</b>	Just in Time logistics for critical deliveries of sensitive goods and maximum quality of transported cargo.	<a href="#">[53]</a>
<b>JWT</b>	JSON Web Token, solution for user access identity and access control	<a href="#">[54]</a>
<b>Key Performance Indicator (KPI)</b>	<p>Key Performance Indicators (KPIs) are the critical, quantifiable measures of progress toward a desired result. They help organizations determine if their efforts are making an impact, allocate resources effectively, and focus improvements where they matter most. KPIs provide a solid foundation for strategic and operational decision-making. Typically, they balance leading indicators (which forecast future performance) with lagging indicators (which reflect outcomes achieved) to guide both planning and review.</p> <p>According to ISO 22400-1:2014, KPI is a quantifiable level of achieving a critical objective</p>	<a href="#">[55]</a>
<b>Key Value (KV)</b>	Values important to people and society that may be directly addressed or indirectly impacted by future network technology	<a href="#">[56]</a>
<b>Key Value Indicator (KVI)</b>	Measurable quantity or requirement that in some form provides an estimate of an affected Key Value (KV). It should thereby be possible to formulate targets using KVIs, e.g., in the form of number of users of a service fulfilling a condition or perceived fulfilment of required value using a service. A specific KV could be estimated through multiple KVIs	<a href="#">[57]</a>
<b>Load Forecasting</b>	The process of predicting future electricity demand over various time horizons to ensure reliable, efficient, and cost-effective operation of power systems. (See also additional reference in Cluster 3E)	<a href="#">[58]</a>
<b>LoRaWAN</b>	LoRaWAN is a low-power wireless network protocol that allows devices, like sensors, to communicate over long distances using very little energy. It is widely used for smart cities, agriculture, and industrial monitoring.	<a href="#">[59]</a>
<b>LSTM</b>	Long Short Term-Memory (See also additional reference in Cluster 3A)	<a href="#">[60]</a>
<b>LTE</b>	Long-Term Evolution, fourth generation cellular networks	<a href="#">[61]</a>
<b>Meta Operating System</b>	A Meta-Operating System (MetaOS) for the continuum can thus be defined as a system of OS across the continuum.	<a href="#">[62]</a>

	<p>Similar to OS, the goal of a MetaOS is to provide transparent, efficient, robust and secure management, facilitating the use of the continuum while enabling portability (as well as interoperability in this case). Note that the cloud continuum is already being widely utilized today; however, the programmer (or the operator) must build ad hoc solutions that use a plethora of technologies that are not always compatible or easy to interconnect.</p>	
<b>Model Observability</b>	<p>Model observability is a practice to validate and monitor ML model performance and behaviour by measuring critical metrics, indicators, and processes to ensure that the model works as expected in production.</p> <p>It involves end-to-end event logging and tracing to track and diagnose issues quickly during training, inference, and decision-making cycles. It lets you monitor and validate training data to check if it meets the required quality standards. It also assists in model profiling, detecting bias and anomalies that could affect the ML model's performance</p>	<a href="#">[63]</a>
<b>Monitoring</b>	<p>The practice of continuously collecting, analyzing, and alerting on system metrics to ensure applications and infrastructure operate as expected.</p>	<a href="#">[64]</a>
<b>NB-IoT</b>	<p>Narrowband IoT (NB-IoT) is a mobile network technology designed for connecting many devices that use little power and send small amounts of data, like sensors or meters. It works over long distances and has strong coverage, even indoors.</p>	<a href="#">[65]</a>
<b>Network domain</b>	<p>A network domain is a logical administrative boundary within one or more interconnected networks under unified management. It defines a set of devices (hosts, servers, printers, routers/switches), network resources, security policies, naming services, and authentication/authorization mechanisms governed by a common authority. Within this domain, address spaces, resource access, and routing or resolution policies are controlled in a coherent way. Network domains may be subdivided into subdomains or related domains that trust each other or interact via defined interfaces or trust boundaries.</p>	<a href="#">[66]</a>
<b>Network Slicing</b>	<p>A mechanism that allows multiple logical networks (slices) to be created on top of a shared physical infrastructure. Each slice is tailored to meet specific requirements (e.g., low latency for URLLC, high throughput for eMBB).</p>	<a href="#">[67]</a>
<b>NGSI-LD</b>	<p>Next Generation Service Interface for Linked Data is an information model and API for publishing, querying and subscribing to context information. Standardized by ETSI through TC DATA</p>	<a href="#">[68]</a>
<b>OEE</b>	<p>A composite indicator that measures equipment effectiveness through <math>OEE = Availability \times Performance \times Quality</math>; it is used</p>	<a href="#">[69]</a>

<b>(Overall Equipment Effectiveness)</b>	as a core line KPI to reduce downtime, improve effective speed, and minimize defects.	
<b>Optimization</b>	Process of finding the best solution to a design problem by minimizing or maximizing a performance measure within given constraints.	<a href="#">[70]</a>
<b>Orchestration</b>	Automated coordination and management of containerized applications (e.g., Kubernetes), including deployment, scaling, and networking.	<a href="#">[71]</a>
<b>Orchestration Blueprint</b>	A structured plan derived from service descriptors that instructs the orchestrator how to provision, configure, and manage services across resources.	<a href="#">[72]</a>
<b>OSS/BSS</b>	OSS/BSS, in telecommunications, refer to operations support system and business support system. The distinction emphasizes a separation of concerns between maintaining network operations and the business around which that network is built.	<a href="#">[73]</a>
<b>Overlay Networking</b>	An overlay is a method of defining layers of network abstraction using software to run multiple separate, virtualized networks on top of a physical layer. Network overlays provide the ability to deploy flexible services based on ever-changing connectivity and mobility demands of the endpoints and applications.	<a href="#">[74]</a>
<b>Pilot</b>	<p>A pilot activity is a large-scale, integrated demonstration within a specific vertical sector (cluster), in which project partners jointly implement, validate, and assess innovative solutions in real-world conditions.</p> <p>A pilot combines multiple use cases, technologies, and stakeholders to test the interoperability, scalability, and societal or economic impact of the proposed innovations, bridging the gap between research outcomes and market adoption.</p>	<a href="#">[75]</a>
<b>Predictive Maintenance</b>	Predictive maintenance is a proactive approach that leverages real-time and historical data—often collected via sensors and advanced monitoring systems—to forecast when equipment is likely to fail or degrade.	<a href="#">[76]</a>
<b>Quality of Service (QoS)</b>	Quality of Service (QoS) refers to the collective set of performance characteristics of a networked or distributed ICT system that determine its ability to deliver data or services according to predefined quality requirements. These characteristics typically include latency, jitter, bandwidth, reliability, and packet loss, and may also extend to availability and priority handling. QoS mechanisms enable the classification, prioritization, and management of traffic or resource allocation to meet specific service-level objectives in	<a href="#">[77]</a>

	communication networks, cloud infrastructures, and edge environments.	
<b>Radar</b>	A system for detecting the presence, direction, distance and speed of objects by sending pulses of radio waves which are reflected off the object back to the source.	[78]
<b>Rejection Rate</b>	Percentage of discarded units over the total produced, e.g., after the labeling machine: $\text{Rejection Rate} = (\text{rejected units} \div \text{total units}) \times 100$ ; it directly impacts the Quality component of OEE and guides inspection and machine adjustment actions.	[79]
<b>Role-Based Access Control (RBAC)</b>	A security model in which users are assigned roles (e.g., customer, service developer, service provider) and permissions are granted according to those roles, rather than to individuals. (This reference has also an additional definition in Cluster 3A)	[80]
<b>Root of Trust</b>	Roots of Trust are highly reliable hardware, firmware, and software components that perform specific, critical security functions. Because roots of trust are inherently trusted, they must be secure by design. Roots of trust provide a firm foundation from which to build security and trust.	[81]
<b>SDG</b>	ETSI's Software Development Groups (SDGs) combine the best of ETSI's standardization support with the tools and processes required for successful collaborative software development.	[82]
<b>SDO</b>	A Standards Development Organization (SDO) is a group that creates and maintains technical standards for a specific industry or field to ensure quality, safety, interoperability, and efficiency.	[83]
<b>Secure Integration Fabric (SIF)</b>	A programmable overlay network fabric that provides secure, policy-driven connectivity across distributed domains. By design, SIF eliminates inbound ports, removes traditional networking complexity, and makes domains inherently more secure, while ensuring encrypted, identity-based, and trustless east-west and north-south data flows.	[84]
<b>Semantic Mapping</b>	The process of establishing relationships and connections between different data sources or systems using semantic web technologies. It involves mapping the data elements from one system to another in a way that allows them to be integrated and used together.	[85]
<b>Service Descriptor</b>	A machine-readable artefact (e.g., YAML, TOSCA, TMF resource model) that formally describes a service's structure, requirements, and lifecycle.	[86]

<b>Service Onboarding</b>	The automated process of integrating a new service into an orchestration environment, including validation, descriptor generation, and lifecycle registration.	<a href="#">[87]</a>
<b>SLA</b>	Service Level Agreement	<a href="#">[88]</a>
<b>SOA</b>	Service Oriented Architecture	<a href="#">[89]</a>
<b>SWOT Analysis</b>	A strategic planning tool used to evaluate the Strengths, Weaknesses, Opportunities, and Threats involved in a project, organization, or business venture. SWOT analysis helps in crafting strategies by aligning internal capabilities with external realities.	<a href="#">[90]</a>
<b>Telemetry</b>	A telemetry view for systems is a graphical or tabular dashboard that displays real-time and historical operational data about a system's performance, resource usage, and health status. It typically includes metrics such as CPU, memory, disk, and network utilization, along with logs, alerts, and trends, to help administrators monitor, analyse, and maintain system reliability.	<a href="#">[91]</a>
<b>Testbed</b>	A platform, environment, or set of tools and infrastructure that supports rigorous, repeatable, and transparent experimentation of emerging technologies.	<a href="#">[92]</a>
<b>TM Forum</b>	TM Forum is a global industry association for service providers and their suppliers in the telecommunications industry.	<a href="#">[93]</a>
<b>Use Case</b>	A use case is a specific scenario or application within a pilot activity that demonstrates how a particular innovation, technology, or process addresses a defined need or challenge	<a href="#">[94]</a>
<b>UPF</b>	The UPF is the key data forwarding element in the 5G Core. It is responsible for handling the user plane traffic (actual data packets between the UE and external data networks). Its main functions include:	<a href="#">[95]</a>
<b>Validation</b>	Validation is the process of confirming, through objective evidence, that a system, service, or component meets the needs and requirements of its intended use under real or simulated operational conditions. It ensures that the implemented solution fulfills user expectations and performs effectively in its target environment. Validation complements verification, which checks that a product was built correctly according to specifications.	<a href="#">[96]</a>
<b>Vehicle-to-Grid (V2G)</b>	Capability of transferring energy bi-directionally between an electric vehicle and the electrical grid.	<a href="#">[97]</a>
<b>Verifiable Credentials</b>	Digital credentials which following w3C open standards which allow for the decentralisation of trust mechanisms VCs can be issued by anyone, about anything, and can be presented to and verified by everyone. The issuer is the user or organisation that generates a credential. The credential is then given to the	<a href="#">[98]</a>

	Holder who stores it for later use. The Holder can then prove something about themselves by presenting their credentials to a Verifier.	
<b>Verification</b>	Verification is the process of evaluating a system, component, or software product to determine whether it complies with specified requirements. It focuses on confirming that the product has been built correctly, according to its design specifications and standards, using inspection, analysis, simulation, or testing. Verification precedes validation and ensures that each development stage's outputs are consistent and complete with respect to the inputs and design objectives.	<a href="#">[99]</a>
<b>VRP</b>	Vehicle Routing Problem, advanced NP complete algorithmic solutions for optimisation of routes taking into consideration critical parameters such as time windows, weather conditions, traffic, IoT sensor data etc	<a href="#">[100]</a>
<b>Wireless Sensor</b>	A device that detects or measures physical properties (e.g., temperature, humidity, distance) and sends it wirelessly to other devices or a centralized location.	<a href="#">[101]</a>
<b>Zero Trust Networking (ZTN)</b>	A security model ensuring that no user, device, or application is inherently trusted, even if inside the network perimeter.	<a href="#">[102]</a>

## A. CLUSTER 1 SPECIFIC USE CASE GLOSSARY

Table 4.2: Cluster 1 terms & definitions.

Term	Definition	Reference
<b>Belt Cleaning Systems (Scraper)</b>	<p>Conveyor belt cleaners (scrapers) are used to remove fugitive material, otherwise known as carry back, from the return side of the conveyor belt after the bulk material has been discharged. Ideally, this will be accomplished from within the chute works so that the removed carry back will pass onto the next system element. However, other locations may also be suitable.</p>	<a href="#">[103]</a>
<b>Belt conveyor (system)</b>	<p>A belt conveyor system is a mechanical handling system used to transport materials or goods from one point to another using a continuous belt loop. It's widely used in industries such as manufacturing, mining, logistics, and packaging due to its efficiency and versatility. A belt conveyor system consists of two or more pulleys (sometimes referred to as drums), with a closed loop of carrying medium—the conveyor belt—that rotates about them</p>	<a href="#">[104]</a>
<b>Belt Splice</b>	<p>A belt splice is the section of a conveyor belt resulting from joining two ends of a conveyor belt to form a continuous loop. This process is crucial for creating functional, productive conveyor systems and is used to repair damage, extend belt life, or for new installations. Common splicing methods include mechanical splicing, which uses metal fasteners, and vulcanized splicing (hot or cold), which uses heat and adhesives to create a seamless bond.</p>	<a href="#">[105]</a>
<b>Condition-Based Maintenance</b>	<p>Condition-Based Maintenance is a maintenance strategy that involves monitoring the actual condition of equipment to decide what maintenance needs to be done. It is based on the idea that maintenance should only be performed when certain indicators show signs of decreasing performance or upcoming failure.</p>	<a href="#">[106]</a>
<b>Condition monitoring</b>	<p>Condition monitoring is the process of using sensors to collect and analyze data, such as vibration and temperature, from operating machinery to detect changes and identify developing faults. This proactive approach to maintenance helps predict potential failures, enabling maintenance to be scheduled before significant damage or costly downtime occurs. It is a key component of predictive maintenance, aiming to maintain equipment health and performance by taking action based on actual conditions rather than fixed schedules</p>	<a href="#">[107]</a>
<b>Decision support (system)</b>	<p>A Decision Support System is a computerized program that supports determinations, judgments, and courses of action in an organization or business. It analyzes large volumes of</p>	<a href="#">[108]</a>

	data and synthesizes it into comprehensive information to aid in decision-making	
<b>Digitalized Ground Support</b>	IoT solution for tracking ground support status used in mining	<a href="#">[109]</a>
<b>Edge-Cloud</b>	A distributed cloud infrastructure that extends cloud capabilities (compute, storage, AI, orchestration) closer to end devices or users, reducing latency, bandwidth usage, and dependency on centralized data centers.	<a href="#">[110]</a>
<b>Geophone</b>	A sensor for detecting ground vibrations, commonly used in mine to monitor seismicity	<a href="#">[111]</a>
<b>Geotechnical Engineering</b>	Geotechnical engineering, also known as geotechnics, is the branch of civil engineering concerned with the engineering behavior of earth materials	<a href="#">[112]</a>
<b>Induced Seismicity</b>	Induced seismicity is typically earthquakes and tremors that are caused by human activity that alters the stresses and strains on Earth's crust.	<a href="#">[113]</a>
<b>IPS (Indoor positioning system)</b>	A system used to localize tags in GPS denied environments	<a href="#">[114]</a>
<b>Life-of-Mine</b>	A determination of the number of years a site will mine and process ore based on various input conditions, including economic, environmental, and business considerations	<a href="#">[115]</a>
<b>Micro seismicity</b>	Micro seismicity refers to low-magnitude earthquakes, often magnitudes below zero.	<a href="#">[116]</a>
<b>Mining 4.0</b>	Adaptation of the industry 4.0 concept with focus on mining	<a href="#">[117]</a>
<b>On-prem Cloud</b>	A private cloud infrastructure hosted and managed by an organization on its own physical premises, using its own hardware and software, rather than a third-party public cloud.	<a href="#">[118]</a>
<b>Tag</b>	A device used for localizing assets such as humans, machine, equipment etc	<a href="#">[119]</a>

## CLUSTER 2 SPECIFIC USE CASE GLOSSARY

Table 4.3: Cluster 2 terms & definitions.

Term	Definition	Reference
<b>Berthing assistance</b>	A set of digital and communication tools that help ships safely and efficiently maneuver into and out of berths. Radars provide precise situational awareness of the vessel's position relative to the quay and nearby obstacles, while 5G enables real-time, high-speed data exchange between the ship, port control, and automated systems. This combination reduces docking risks, saves time, and improves operational efficiency.	<a href="#">[120]</a>
<b>Fill-level sensor</b>	A device used to measure the amount of liquid or bulk material in a container, often continuously or at specific thresholds.	<a href="#">[121]</a>
<b>Flood detection</b>	Flood detection is the process of identifying the presence of water in an area where it is not wanted, using devices and systems that monitor moisture levels, water flow, or water height to trigger alerts or activate preventative measures	<a href="#">[122]</a>
<b>Flood mitigation</b>	Flood mitigation refers to the strategies and measures implemented to reduce the impact of flooding on communities and the environment. It encompasses a range of techniques aimed at preventing flood damage	<a href="#">[123]</a>
<b>Maritime Port security</b>	The application of advanced digital tools and smart systems to protect port infrastructure, cargo, ships, and people against threats such as unauthorized access, smuggling, terrorism, or cyberattacks. Emerging technologies include AI-driven video surveillance, drones, cybersecurity measures, IoT sensors, and blockchain for secure data handling. These innovations enhance situational awareness, early threat detection, and rapid response in modern ports.	<a href="#">[124]</a>
<b>Maritime traffic monitoring (in ports)</b>	The process of tracking, managing, and coordinating the movement of vessels within port waters using technologies such as radar, Automatic Identification Systems (AIS), sensors, and 5G networks. Its goal is to ensure safe navigation, optimize traffic flow, reduce congestion, and prevent accidents in busy port areas.	<a href="#">[125]</a>
<b>Traffic engineering</b>	A branch of civil engineering that uses engineering techniques to achieve the safe and efficient movement of people and goods on roadways	<a href="#">[126]</a>
<b>Vehicle classification</b>	Vehicle classification is the process of grouping motor vehicles based on their characteristics. This process takes into account factors such as the type of vehicle, its usage purpose, size, engine power, and more	<a href="#">[127]</a>

<b>Vehicle counting</b>	Systematic process of tracking and quantifying the number of cars traveling a particular stretch of road or a defined area over a specific period	<a href="#">[128]</a>
<b>Water level sensor</b>	Sensors that measure the height of water and alert when water levels approach dangerous thresholds	<a href="#">[129]</a>

## CLUSTER 3A SPECIFIC USE GLOSSARY

Table 4.4: Cluster 3A terms & definitions.

Term	Definition	Reference
<b>AgriBot</b>	Autonomous Ground Robot (UGV) used for precision spraying and field-level interventions.	<a href="#">[130]</a>
<b>AgroApps 360</b>	A commercial Farm Management Information System (FMIS) providing real-time crop monitoring, decision support, and analytics.	<a href="#">[131]</a>
<b>AI</b>	Artificial Intelligence	<a href="#">[132]</a>
<b>AIoT</b>	Artificial Intelligence of Things	<a href="#">[133]</a>
<b>API</b>	Application Programming Interface	<a href="#">[134]</a>
<b>ATSI</b>	AgriTech Transformation and Sustainability Initiative	<a href="#">[135]</a>
<b>BAR</b>	Barba Stathis	<a href="#">[136]</a>
<b>Blockchain</b>	Blockchain is a shared, immutable digital ledger, enabling the recording of transactions and the tracking of assets within a business network and providing a single source of truth.	<a href="#">[137]</a>
<b>Cluster 3A</b>	The COP-PILOT pilot testbed focused on Agri-tech transformation for leafy vegetable production.	<a href="#">[138]</a>
<b>Copernicus Sentinel-2</b>	Satellite-based Earth Observation system used for capturing NDVI and crop performance data.	<a href="#">[139]</a>
<b>CSV</b>	Comma-Separated Values	<a href="#">[140]</a>
<b>CWSI</b>	Crop Water Stress Index – used to estimate plant water stress using thermal imagery and reference temperatures	<a href="#">[141]</a>
<b>DLT</b>	Distributed ledger technology, Hyperledger Fabric for supply chain transparency, transaction logging, authenticity and immutability.	<a href="#">[142]</a>
<b>DMP</b>	Data Management Plan	<a href="#">[143]</a>
<b>DSS</b>	Decision Support System	<a href="#">[144]</a>

<b>Edge Computing</b>	Local data processing near the source (e.g., in-field) to ensure rapid analytics and decision-making even with limited connectivity.	<a href="#">[145]</a>
<b>EO</b>	Earth Observation	<a href="#">[146]</a>
<b>ERP</b>	Enterprise Resource Planning	<a href="#">[147]</a>
<b>EVI</b>	Enhanced Vegetation Index – similar to NDVI but designed to enhance vegetation signal in high biomass areas and reduce atmospheric influences	<a href="#">[148]</a>
<b>FMIS</b>	Farm Management Information System	<a href="#">[149]</a>
<b>FMIS Sensor Engine</b>	The AgroApps module responsible for harmonizing sensor and third-party data streams into the FMIS.	<a href="#">[150]</a>
<b>GNDVI</b>	Green Normalized Difference Vegetation Index – an index variant using green light, often more sensitive to chlorophyll concentration	<a href="#">[151]</a>
<b>GUI</b>	Graphical User Interface	<a href="#">[152]</a>
<b>Hyperledger Fabric</b>	A permissioned blockchain framework used for secure data logging, traceability, and smart contracts in the COP-PILOT infrastructure.	<a href="#">[153]</a>
<b>IoT</b>	Internet of Things	<a href="#">[154]</a>
<b>JIT</b>	Just in Time logistics for critical deliveries of sensitive goods and maximum quality of transported cargo.	<a href="#">[155]</a>
<b>Just-In-Time (JIT) Logistics</b>	A logistics management strategy that optimizes delivery scheduling and routing to reduce spoilage and emissions.	<a href="#">[156]</a>
<b>LAI</b>	Leaf Area Index – the ratio of total upper leaf surface area to the ground area, indicating crop canopy density and productivity	<a href="#">[157]</a>
<b>LSTM</b>	Long Short-Term Memory (AI model)	<a href="#">[158]</a>
<b>MQTT</b>	Message Queuing Telemetry Transport	<a href="#">[159]</a>
<b>MSAVI</b>	Modified Soil-Adjusted Vegetation Index – adjusts vegetation indices for soil brightness in sparse vegetation areas	<a href="#">[160]</a>
<b>Multispectral Imaging</b>	A remote sensing technique using UAVs to monitor vegetation indices, crop health, and weed detection.	<a href="#">[161]</a>
<b>NDVI</b>	Normalized Difference Vegetation Index	<a href="#">[162]</a>
<b>NDWI</b>	Normalized Difference Water Index – used to detect water content in vegetation and monitor water bodies from satellite imagery	<a href="#">[163]</a>

<b>PowerFleet</b>	An AI-driven fleet management and logistics optimization system enabling real-time routing by iLink	<a href="#">[164]</a>
<b>RBAC</b>	Role-Based Access Control	<a href="#">[165]</a>
<b>REST</b>	Representational State Transfer (API architecture style)	<a href="#">[166]</a>
<b>RGB</b>	Red Green Blue (colour model)	<a href="#">[167]</a>
<b>RS</b>	Remote Sensing	<a href="#">[168]</a>
<b>SDM</b>	System Dynamics Modelling	<a href="#">[169]</a>
<b>SSO</b>	Single Sign-On	<a href="#">[170]</a>
<b>TLS</b>	Transport Layer Security	<a href="#">[171]</a>
<b>UAV</b>	Unmanned Aerial Vehicle	<a href="#">[172]</a>
<b>UC#3A.1</b>	Integrated Precision Agriculture and Crop Monitoring – Use Case focused on crop health and anti-nutrient detection.	<a href="#">[173]</a>
<b>UC#3A.2</b>	Advanced AgriRobotics for Autonomous Intervention – Use Case focused on precision weed detection and spot spraying.	<a href="#">[174]</a>
<b>UC#3A.3</b>	Secure Data Management and Interoperability – Use Case focused on blockchain, federated data governance, and traceability.	<a href="#">[175]</a>
<b>UC#3A.4</b>	Smart Logistics and Supply Chain Optimization – Use Case focused on dynamic routing and freshness-driven delivery.	<a href="#">[176]</a>
<b>UGV</b>	Unmanned Ground Vehicle	<a href="#">[177]</a>
<b>UI</b>	User Interface	<a href="#">[178]</a>
<b>UX</b>	User Experience	<a href="#">[179]</a>
<b>VRP</b>	Vehicle Routing Problem, advanced NP complete algorithmic solutions for optimisation of routes taking into consideration critical parameters such as time windows, weather conditions, traffic, IoT sensor data etc	<a href="#">[180]</a>
<b>Wearable Plant Sensors</b>	IoT sensors attached to spinach plants to monitor anti-nutrient content and stress indicators.	<a href="#">[181]</a>

## CLUSTER 3E SPECIFIC USE CASE GLOSSARY

Table 4.5: Cluster 3E terms & definitions.

Term	Definition	Reference
<b>AD (Anaerobic Digestion)</b>	Biochemical process converting organic waste into biogas (CH <sub>4</sub> , CO <sub>2</sub> ) and digestate	<a href="#">[182]</a>
<b>AwifLEX Gas Analyzer</b>	Gas measurement device monitoring CH <sub>4</sub> , CO <sub>2</sub> , O <sub>2</sub> , H <sub>2</sub> S, H <sub>2</sub> in biogas plants	<a href="#">[183]</a>
<b>Biogas Plant</b>	A biogas plant is a facility that converts organic waste into renewable energy and fertilizer through anaerobic digestion	<a href="#">[184]</a>
<b>BPO (Biogas Plant Operator)</b>	Entity managing, monitoring, and maintaining the daily operations of a biogas plant to ensure efficient and safe biogas production	<a href="#">[185]</a>
<b>Digital Twin</b>	Virtual representation of a physical process or asset for simulation, forecasting, and what-if analysis	<a href="#">[186]</a>
<b>Flexibility Harvesting</b>	Refers to the process of identifying, accessing, and utilizing the flexible capacity of distributed energy resources (DERs) or consumers to support the stability and efficiency of modern power systems.	<a href="#">[187]</a>
<b>Forecasting Microservice</b>	AI service predicting energy demand per DER or charging point	<a href="#">[188]</a>
<b>High-Resolution Sensor</b>	A device capable of detecting and measuring physical quantities (voltage, amperage, temperature, pH, gas) with fine spatial, temporal, or quantitative detail, enabling the capture of small changes or features that lower-resolution sensors cannot discern	<a href="#">[189]</a>
<b>Industrial Gateway (Ewon Flexy 205)</b>	Edge gateway for collecting and forwarding sensor data to edge servers	<a href="#">[190]</a>
<b>Jetson Orin /Jetson Orin Nano</b>	NVIDIA edge computing hardware for executing AI microservices	<a href="#">[191]</a>
<b>Load Forecasting</b>	The process of predicting future electricity demand over various time horizons to ensure reliable, efficient, and cost-effective operation of power systems.	<a href="#">[192]</a>

<b>Modbus Protocol</b>	Open, widely used communication protocol for industrial automation that enables data exchange between devices using a client-server (master-slave) architecture	<a href="#">[193]</a>
<b>OCPP (Open Charge Point Protocol)</b>	Standard protocol enabling communication between EV chargers and management platforms	<a href="#">[194]</a>
<b>PPC Blue</b>	Infrastructure operator managing EV charging networks	<a href="#">[195]</a>
<b>Predictive Analytics</b>	Predictive Analytics is the use of statistical, machine learning, and data modeling techniques to analyze historical data and make predictions about future events or outcomes. In the context of Cluster 3E, it refers to analysis of historical and real-time data to forecast faults, energy demand, or flexibility	<a href="#">[196]</a>
<b>Predictive Maintenance Microservice</b>	AI service detecting anomalies and estimating equipment degradation to prevent downtime	<a href="#">[197]</a>
<b>SCADA</b>	Supervisory Control and Data Acquisition system for monitoring and controlling industrial processes	<a href="#">[198]</a>
<b>Sensor Module</b>	integrated unit that combines one or more sensors with supporting electronics and packaging to detect physical phenomena and provide usable output signals.	<a href="#">[199]</a>
<b>Telemetry Data</b>	Telemetry Data refers to measurements and information automatically collected from remote or inaccessible sources and transmitted to a central system for monitoring, analysis, and decision-making.	<a href="#">[200]</a>

## CLUSTER 4 SPECIFIC USE GLOSSARY

Table 4.6: Cluster 4 terms & definitions.

Term	Definition	Reference
<b>AOI</b>	Area of Interest	<a href="#">[201]</a>
<b>Soil compaction</b>	Process which damage soil and reduce yield in agricultural land especially by usage of heavy machinery or overwatering	<a href="#">[202]</a>
<b>Soil Moisture</b>	The amount of water held within the pores of the soil, rather than in larger bodies like rivers or lakes. This water is crucial for plant growth, nutrient availability, and a healthy ecosystem, acting as a critical factor in regulating heat and water transfer between the soil, plants, and the atmosphere.	<a href="#">[203]</a>
<b>SWIR</b>	Short-Wave Infrared	<a href="#">[204]</a>
<b>Virtual Moisture Probe (VMP)</b>	Virtual geographical point where soil moisture is made available through modelling	<a href="#">[205]</a>
<b>Water Use Efficiency (WUE)</b>	Reduction of irrigation usage to improve crop yields by providing precise insights into soil moisture conditions	<a href="#">[206]</a>

## GENERIC BUSINESS AND LEGAL GLOSSARY

Table 4.7: General business and legal terms & definitions.

Term	Definition	Reference
<b>Data</b>	Any digital representation of acts, facts or information and any compilation of such acts, facts or information, including in the form of sound, visual or audiovisual recording	<a href="#">[207]</a>
<b>Data Holder</b>	Legal or natural person who has the right or the obligation, in accordance with the Data Act, applicable Union law or national legislation implementing Union law, to use and make available certain data, including, where contractually agreed, product data or related service data which it has retrieved or generated during the provision of a related service.	<a href="#">[208]</a>
<b>Interoperability</b>	The ability of two or more data spaces or communication networks, systems, products, applications or components to exchange and use data in order to perform their functions	<a href="#">[209]</a>
<b>ROI</b>	Return on Investment (ROI) is a profitability metric expressed as a percentage that measures the gains or losses from an investment relative to its initial cost. It is calculated using the formula: $ROI = [(Profit\ from\ Investment - Cost\ of\ Investment) / Cost\ of\ Investment] \times 100$ . ROI is a versatile tool for evaluating	<a href="#">[210]</a>

	the efficiency of a single investment or comparing multiple investment options to make informed financial decisions.	
<b>Social Inclusion</b>	A dynamic, multi-dimensional process aimed at improving the terms and quality of participation in society for individuals and groups who are disadvantaged or marginalised, through the simultaneous removal of barriers and creation of opportunities that enhance their ability, dignity, voice, and access to resources, enabling full participation in economic, social, political, and cultural life.	<a href="#">[211]</a>
<b>Societal Impact</b>	Societal impact is a broad term that describes the impact of research outside academia, defined as an effect on, change or benefit to the economy, society, culture, public policy or services, health, the environment or quality of life, beyond academia	<a href="#">[212]</a>
<b>Sustainable Business Model</b>	A comprehensive framework that describes, analyses, and manages how an organisation creates, delivers, and captures multi-dimensional value (economic, social, and environmental) for a broad range of stakeholders through proactive multi-stakeholder management, while maintaining or regenerating natural, social, and economic capital beyond organisational boundaries and adopting a long-term perspective.	<a href="#">[213]</a>
<b>Value Chain</b>	A series of consecutive steps that go into the creation of a finished product, from its initial design to its arrival at a customer's door. The chain identifies each step in the process at which value is added, including the sourcing, manufacturing, and marketing stages of its production.	<a href="#">[214]</a>



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